(11)

Prepared for

NAVAL CENTER FOR COST ANALYSIS
DEPARTMENT OF THE NAVY
WASHINGTON, D.C. 20350-1100

MARTIN MARIETTA

(11)

QUARTERLY STATUS REPORT

SOFTWARE COST ESTIMATION STUDY

APRIL, 1987

Prepared for

NAVAL CENTER FOR COST ANALYSIS
DEPARTMENT OF THE NAVY
WASHINGTON, D.C. 20350-1100

Under Contract N00014-85-C-0892
Delivery Order No. MCR-86-506
(OFFICE OF NAVAL RESEARCH (ONR))
CDRL Item No. A001 - ISSUE #4
QUARTERLY STATUS REPORT
MCR-86-506

by

Dr. Aaron N. Silver
Mr. William G. Cheadle

MARTIN MARIETTA DENVER AEROSPACE CORP.
P.O. BOX 179
Denver, Colorado 80201

Publication R-0420-87-2

5612N

TABLE OF CONTENTS

QUARTERLY STATUS REPORT

LIST OF FIGURES AND TABLES

I. INTRODUCTION

This quarterly status report contains the results of the "Cost Estimation Study," contract N00014-85-C-0892, conducted for the Naval Center for Cost Analysis (under the auspices of the Office of Naval Research) during the period of performance 12 January 1987 through 04 April 1987. The effort described in this quarterly status report focuses upon the following three areas addressed in Task III: (The statement and objectives of TASK III are given in Appendix I.)

(1) The collection of current AVIONICS data and subsequent derivation of preliminary CER (Cost Estimating Relationship) prototypes for ultimately calibrating the SASET model parameters. This includes the generation of SASET productivity factors and complexity multipliers; and

(2) The categorization and organization of functional sizing data for formulating a suitable AVIONICS data base. This AVIONICS data base will be utilized in the SASET model in generating cost and schedule outputs; and

(3) The calibration of the SASET model AVIONICS data base to ensure verification and validation of all SASET model parameters. In this respect, a total review of SASET requirements has begun. The intent is to update the "SASET REQUIREMENTS" document within the next quarterly reporting period.

In addition, substantive effort is currently being devoted to the computerization of the SASET model on an IBM PC. In this respect, most of the input screens have already been constructed, the data base for Ground Support software has been implemented, and some of the output Tables and Graphics are also operational. Preliminary tests are also being conducted to integrate all these computer modules. Most of the computer computations are in the check out phase, and considerable effort is being made to produce a "user friendly", and easily understood computer package.

II. APPLICABLE REFERENCE DOCUMENTS

The following reference documents provide the essential background for subsequent understanding of the SASET prototype model:

(1) "Lessons Learned Report," Software Cost Estimation Study," Naval Center for Cost Analysis, Contract No. N00014-85-C-0892, Delivery Order No. MCR-86-508, CDRL Item No. A003, April, 1986 (Martin Marietta Publication R-0420-86-1).

(2) "Cost Drivers Report," Software Cost Estimation Study," Naval Center for Cost Analysis, Contract No. N00014-85-C-0892, Delivery Order No. MCR-86-509, CDRL Item No. A004, June, 1986 (Martin Marietta Publication R-0420-86-2).

(3) "CER Methodology Prototype Report," Software Cost Estimation Study," Naval Center for Cost Analysis, Contract No. N00014-85-C-0892, Delivery Order No. MCR-86-510, CDRL Item No. A005, October, 1986 (Martin Marietta Publication R-0420-86-6).

III. RESULTS OBTAINED

The essential results obtained during this quarter are described in detail, and fully documented in the "CER (Cost Estimating Relationship) MODEL PLANNING REPORT," CDRL Item No. A006 (Delivery Order No. MCR-87-511) dated April, 1987 (Martin Marietta Corporation Publication R-0420-87-1). This report discusses the derivation of Preliminary CER prototypes, AVIONICS Functional Sizing Data Base, and the subsequent calibration of the AVIONICS data. Also included are some examples of calibration data in tabular form. These data are being used to validate the SASET model parameters, and to refine some of the functional data collected.

3.1 Preliminary CER Prototype for AVIONICS DATA

Table 3.-1 summarizes some of the basic raw data collected in deriving preliminary CER's for AVIONICS. Basically, the data are organized by type of software, i.e., Systems, Applications, and Support, and further delineated into either assembly or HOL (Higher Order Language). In addition, these data pertain to the Software Engineering functions only, and do not include the Systems Engineering or Test organizations and their related activities. Also, the respective life cycle phases addressed were requirements, design, code, and test. (These data do not include the planning or maintenance phases.)

Figure 3.-1.1 illustrates the plot of these seven (7) AVIONICS data points using a log-log scale. In addition, the circled points labeled F-111, and AWACS represent previous programs which were similar in nature to the current data obtained. The generic form of the fitted equation is a straight line given by:

$$\log(\text{HOURS}) = \log(\text{CONSTANT}) + (\text{EXPONENT})\log(\text{HOL EQ}).$$

Obviously, the (EXPONENT) represents the slope of the line, which is also the productivity factor. For this sample plot, the value obtained is approximately 3.9 Hours/LOC. This now represents a sample value for use in the SASET model. Also, the AVIONICS functions associated with this data base will be included in the SASET model. These data will conform to the indexing system developed in the following section. (Section 3.2, Functional Sizing of AVIONICS Data).

It is anticipated that additional effort will be devoted to refine the AVIONICS data base. For example, the LANTIRN program contains pertinent cost, sizing, and schedule data concerning the individual CPCI's developed, down to the module level.

Table 3.-1 Summary of AVIONICS S/W Programs

(1) PAE (Precision Attack Enhancement)
AVIONICS Support S/W
17,000 HOL Source Lines of Code
Language - Jovial. New HOL equivalents: 17,000
33,864 hours for S/W Development

(2) Laser Spot Tracker (on board F-18)
AVIONICS Applications S/W
9,082 Assembly Language Source Lines of Code
Language - Assembly. New HOL equivalents, 2,331
16,268 hours for S/W Development

(3) TAD's (Laser System on Apache Helicopter)
AVIONICS Applications S/W
21,000 Assembly Language Source Lines of Code
Language - Assembly. New HOL equivalents: 6,167
25,232 hours for S/W Development.

(4) ASSAULT BREAKER
AVIONICS Applications S/W
12,200 Assembly Language Source Lines of Code
Language - Assembly. New HOL equivalents: 4,067
15,438 hours for S/W Development.

(5) Single Seat Aircraft (night attack fighter)
AVIONICS Applications S/W
8,000 Assembly Language Source Lines of Code
Language - Assembly. New HOL equivalents: 2,667
10,641 hours for S/W Development.

(6) Operational Flight Program (close air support)
AVIONICS Applications S/W
14,100 Assembly Language Source Lines of Code
Language - Assembly. New HOL equivalents: 4,700
19,721 hours for S/W Development.

(7) LANTIRN
AVIONICS Applications S/W
310,000 Source Lines of Code (Assembly/Fortran)
265,428 new HOL equivalents.
614,200 hours for S/W Development.

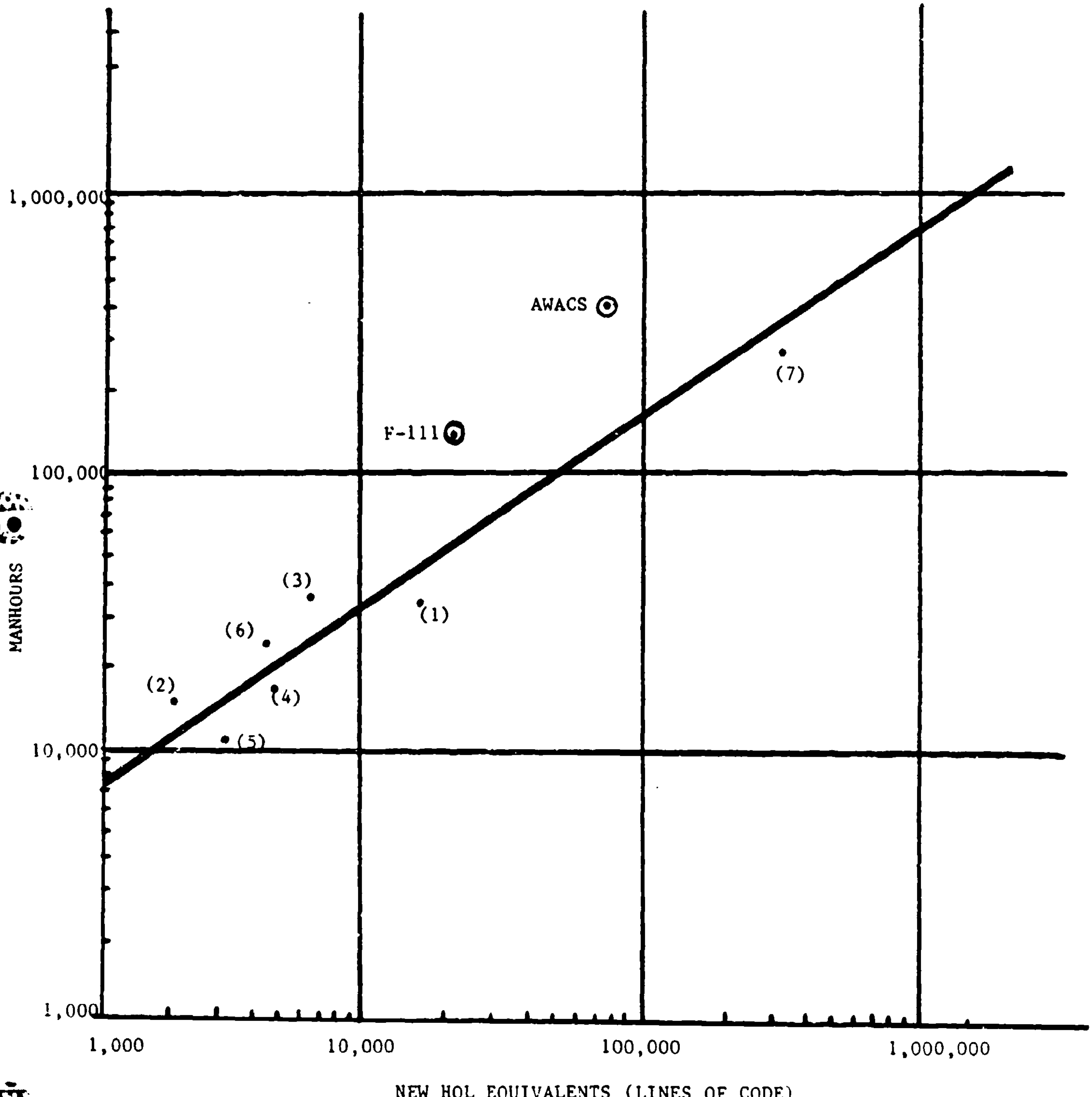


Figure 3.-1.1 PLOT OF NEW HOL EQUIVALENTS VS. MANHOURS

3.2 Functional Sizing of AVIONICS Data

Table 3.-2 illustrates the overall scheme for catagorizing software functional data. This specific classification hierarchy was obtained from the most recent (January, 1987) ASPS Cost Reporting Document (Section VIII, Software Reporting Requirements). Although AVIONICS is delineated as a special category, it should be noted that other given platforms, such as space-borne or shipboard, do indeed have similar functions described by index elements 2.1 to 2.6. Also, the "Off-Line Training" (comprising index elements 15.1 to 15.4) has been reconfigured into two (2) Data Reduction items (Category A and B) to reflect activities involving moderate and extensive processing requirements, in either real-time or off-line modes. This functional list is utilized as a template for subsequently structuring the SASET model data base. In some instances an addititional level of indexing was used to describe lower level functions. For example, when representing the functional activities for "Processing Software" under "Modeling", the SASET data base hierarchy will index to two lower levels, i.e., type of "modeling" and the respective parameters associated with the "modeling" functions. Thus, Rapid Prototyping (type of modeling) has sub-categories of requirements, design, graphics, etc, as indenture levels.

Some Normalized Functional Sizing Statistics for AVIONICS are shown in Table 3.-3. These data were originally obtained from ARINC Research Corporation, technical report "Software Sizing and Cost Estimation", (July, 1985) prepared for the Office of the Controller (NCDS), Department of the Navy, Washington, D.C. under Contract N00600-87-D-4045, Delivery Order No. 0003, CDRL Item No. A0002. However, these respective values have been modified using both updated data and the algorithms formulated in the SASET model to reflect nominal baseline numbers. The resultant processed values are used as input to the SASET models. The SASET modifications reflect an increase of approximately 73%. This factor takes into account both the skewness of the distribution used in the SASET sizing algorithms, and the range of three (3) sigma values covered by these functions.

TABLE 3.-2

Software Functions

Category	Index	Function
Displays	1.1	Avionics
	1.2	Command, Control, & Communications
	1.3	Other
Avionics	2.1	Mission Planning
	2.2	Navigation
	2.3	Aircraft Steering Flight Control
	2.4	Sighting, Designation & Location Determination
	2.5	Weapon Delivery
	2.6	Electronic Countermeasures
	2.7	Other
Command, Control & Communication	3.1	Network Monitoring
	3.2	Network Control & Switching
	3.3	Sensor Control
	3.4	Signal Processing
	3.5	Message Processing
	3.6	Message Distribution
	3.7	Message Logging & Retrieval
	3.8	Data Reduction
	3.9	Other
Executive	4.1	Computer Resource Management
	4.2	Computer Operator Interface
	4.3	Other Terminal Operator Interface
	4.4	Special Device Interface
	4.5	Other Input or Output
	4.6	Error Handling/Reconfiguration/Recovery
	4.7	Multicomputer Configuration Control
	4.8	Performance Monitoring & Data Collection
	4.9	Other
Data Base	5.1	On-line Data Base Retrieval & Output
	5.2	On-line Data Base Initialization & Updating
	5.3	Other
Training	6.1	Control of Exercise Sequencing
	6.2	Operator Performance Data Collection
	6.3	Other
On-Line Equipment Diagnostic	7.1	System Readiness Test
	7.2	Computer Diagnostic
	7.3	Memory Diagnostic
	7.4	Display Diagnostic
	7.5	Switch/Indication Panel Diagnostic
	7.6	I/O Diagnostic
	7.7	Mod Diagnostic
	7.8	Other

TABLE 3.-2

Software Functions (continued)

Category	Index	Function
Operating System	8.1	Computer Resource Management
	8.2	Computer Operator Interface
	8.3	Terminal Operator Interface
	8.4	Input or Output
	8.5	Error Handling/Reconfiguration/Recovery
	8.6	Performance Monitoring & Data Collection
	8.7	Other
Equipment Maintenance	9.1	Off-Line Computer Diagnostics
	9.2	Other
Software	10.1	Higher-Order Language Compiler
	10.2	Assembler
	10.3	Debugger
	10.4	Loader or Editor
	10.5	Other
Off-Line Data Base Management	11.1	Data Base Definition
	11.2	Data Base Initialization & Updating
	11.3	Data Base Retrieval & Output Formatting
	11.4	Data Base Restructuring
	11.5	Off-Line Data Base
	11.6	Other
Design	12.1	Data Base Design
	12.2	Data Base Processor Design
	12.3	Performance Simulation
	12.4	Data Reduction
	12.5	Data Analysis
	12.6	Other
Test Software	13.1	Test Case Generation
	13.2	Test Case Data Recording
	13.3	Test Data Reduction
	13.4	Test Analysis
	13.5	Other
Utilities	14.1	Media Conversions
	14.2	Format Translation
	14.3	Sort/Merge
	14.4	Program Library Maintenance
	14.5	Other

TABLE 3.-2

Software Functions (continued)

Category	Index	Function
Off-Line Training	15.1	Data Reduction, Category A
	15.2	Data Reduction, Category B
	15.3	Scenario Preparation
	15.4	Other
Project Management	16.1	Project Event Status Account
	16.2	Schedule Maintenance/Projection
	16.3	Financial Accounting
	16.4	Software Cost Reporting
	16.5	Hardware Cost Reporting
	16.6	Software Cost Prediction
	16.7	Hardware Cost Prediction
	16.8	Other
Hardware Subsystem Simulations	17.1	Interfacing Hardware Simulations
	17.2	Environmental Simulators
	17.3	Operator Action Simulations
	17.4	Other

TABLE 3.-3

NORMALIZED FUNCTIONAL SIZING STATISTICS FOR AVIONICS

Function Index	ARINC Average Size (LOC)*	SASET Average Size (LOC)*
1.1	633	1096
1.2	2888	5000
1.3	4199	7273
2.2	1376	2383
2.4	2106	3648
2.5	9000	15590
2.6	7057	12223
2.7	3567	6178
3.1	7164	12400
3.2	4296	7440
3.3	5661	9800
3.4	2741	4747
3.5	8220	14237
3.6	1211	2100
3.9	1232	2100
4.1	4129	7150
4.2	6212	10760
4.3	12501	21650
4.4	2512	4350
4.5	560	970
4.8	3434	5950
5.1	6172	10600
5.2	1314	2275
5.3	9021	15625
7.1	898	1555
10.3	795	1375
13.1	3935	6815
13.4	10963	18988
17.1	229	400
17.2	9000	15588

* LINES OF CODE (HOL equivalent)
Less Comments

3.3 Calibration of AVIONICS Data

Figures 3.-1 through 3.-12 illustrate typical calibration curves obtained using the mix complexity and project complexity parameters defined in reference (2) "Cost Drivers Report." The respective curves are based upon AVIONICS data from over 150 real world software development projects. The equation plotted has the following generic form:

$$(\text{Productivity}) = (\text{Factor})\ (\text{Conversion})\ (\text{Mix})^{C1}\ (\text{Prog})^{C2}$$

The four (4) plots shown for each type of software (Systems, Application, Support) illustrate the sensitivity obtained when each of the four (4) variables in the above equation (Factor, Mix, Conversion, and Program) are treated as "independent variables." As can be observed from the curves, these data are well within the range of the productivity factor derived from the CER given in Figure 3.-1.1. Furthermore, the overall variation of complexity factors defined can be utilized to obtain fine gradations of productivity factors within each type of software. Thus, SASET can be validated using the table look-ups from which the plots were originally derived. (Some sample tabular data are given in detail in the "CER MODEL PLANNING REPORT", CDRL Item No. A006, Delivery Order No. MCR-87-511, April, 1987.)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(APPL.-HI.ORDER LANG)

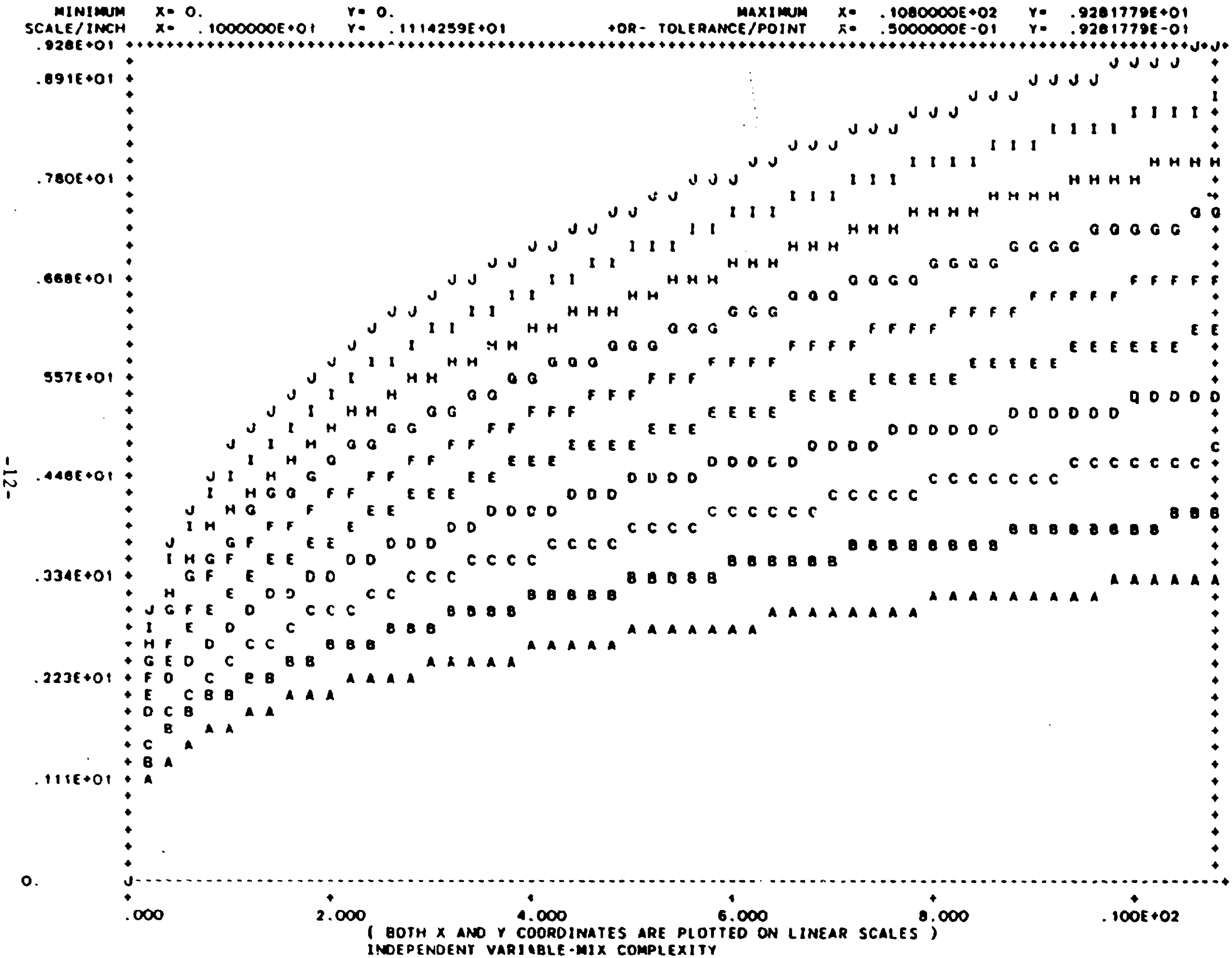


Figure 3.-1 PLOT OF PRODUCTIVITY (MAN-HRS/LOC) VS. MIX COMPLEXITY (PC=200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(APPL.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .5400000E+03 Y= .7736013E+01
SCALE/INCH X= .5000000E+02 Y= .9286931E+00 +OR- TOLERANCE/POINT X= .2500000E+01 Y= .7736013E-01

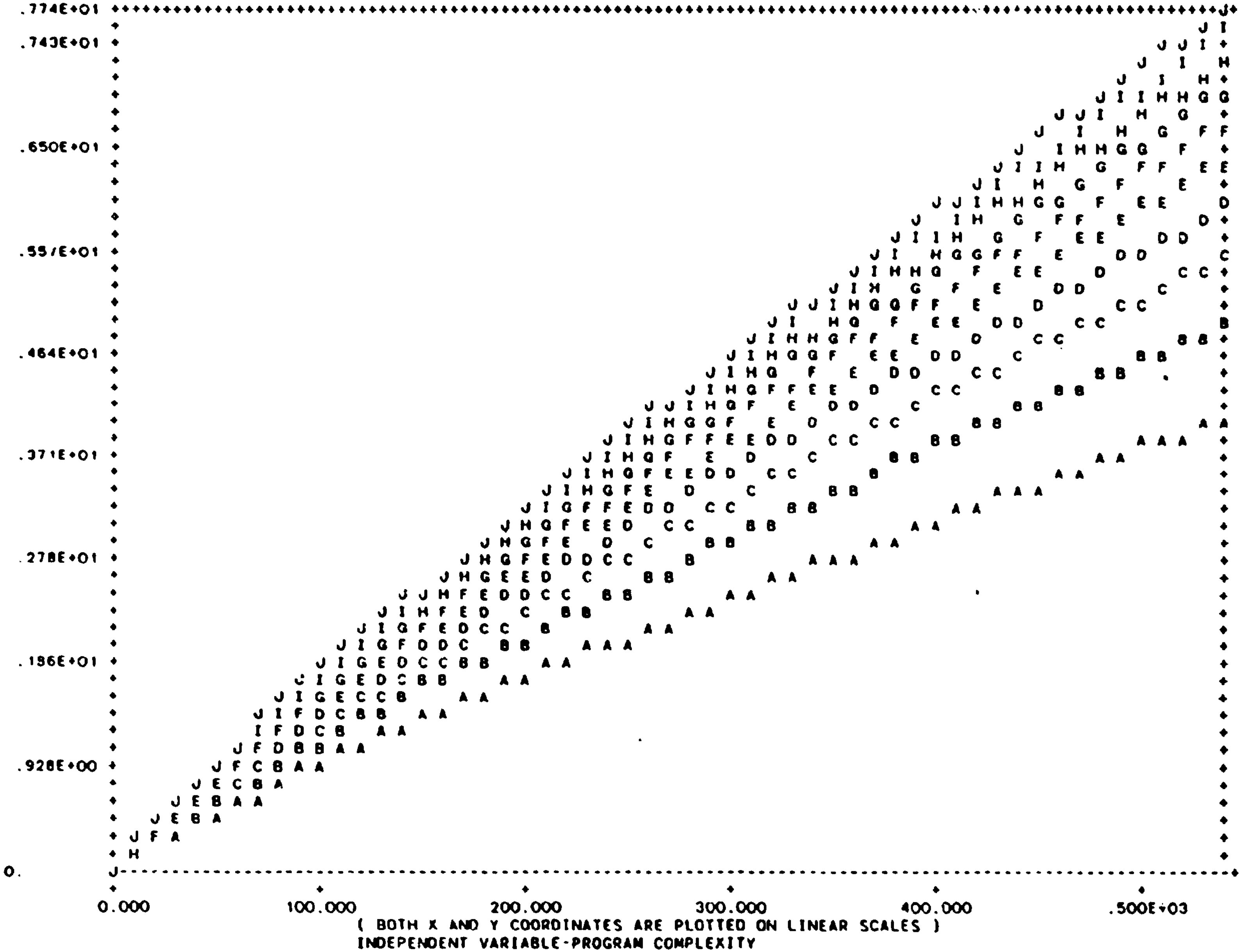
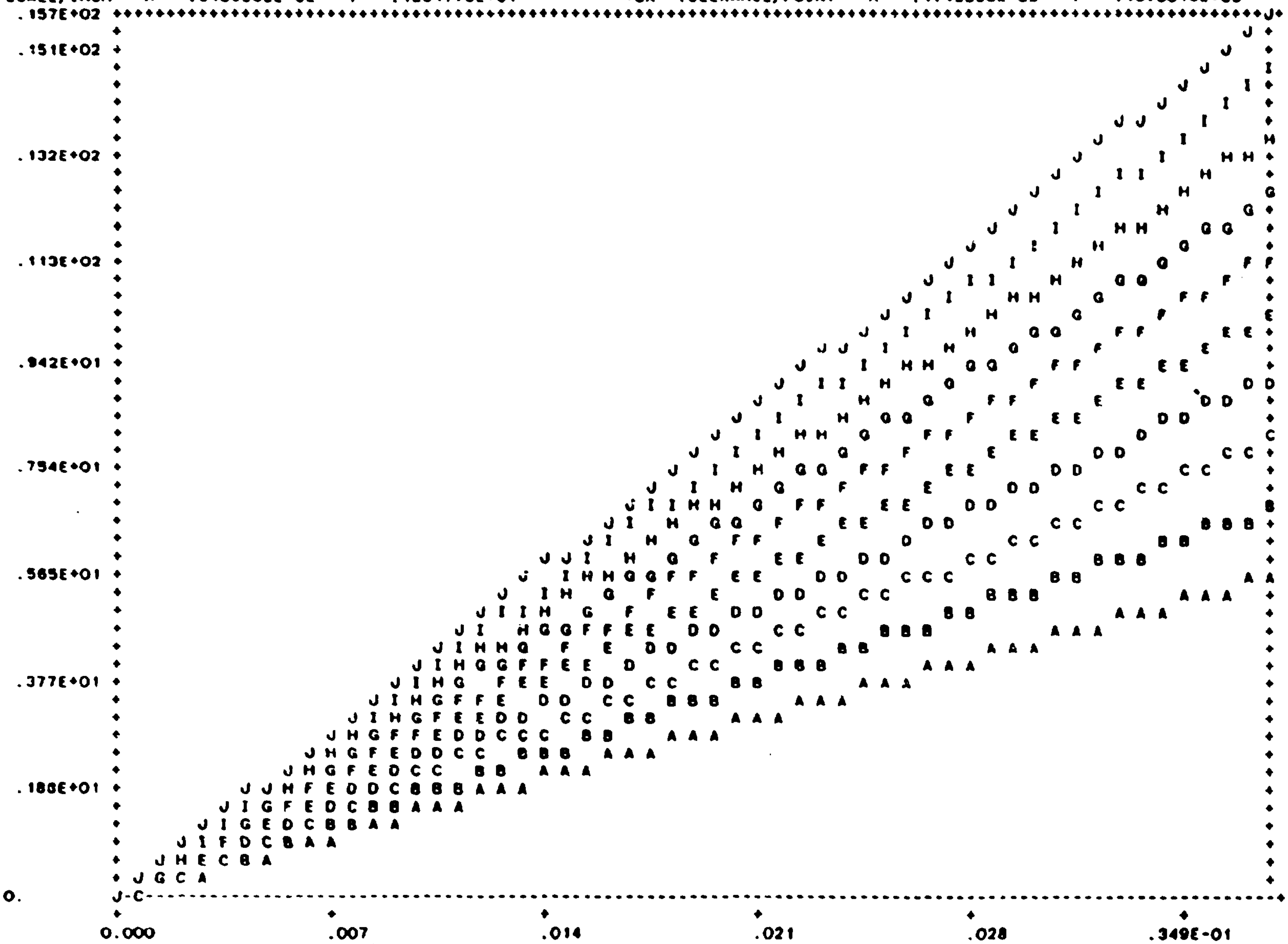


Figure 3.-2 PLOT OF PRODUCTIVITY (HRS/LOC) VS. PROGRAM COMPLEXITY (MC=1 TO 10)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(APPL.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .3764945E-01 Y= .1570016E+02
SCALE/INCH X= .3486060E-02 Y= .1884773E+01 +OR- TOLERANCE/POINT X= .1743030E-03 Y= .1570016E+00

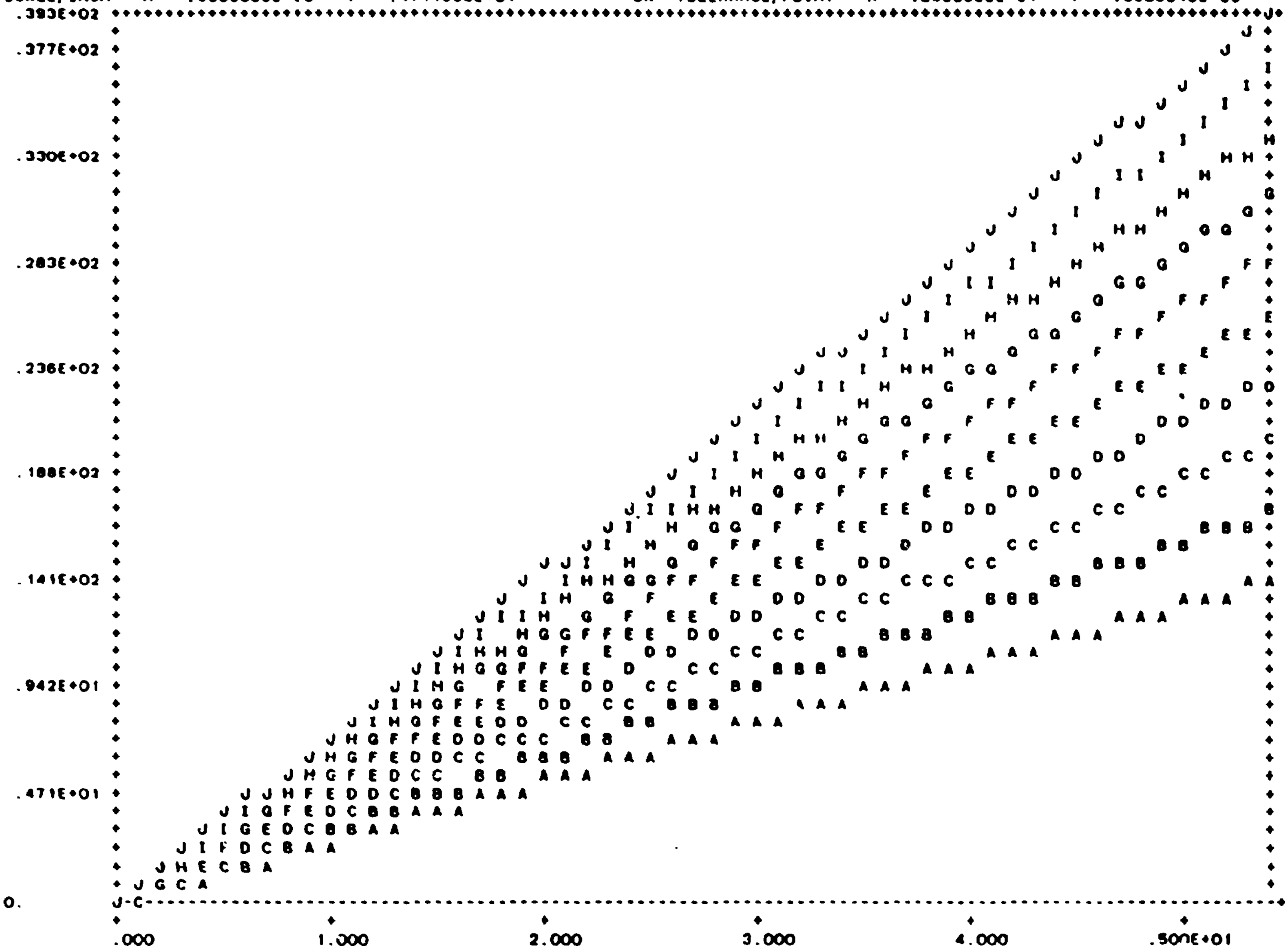


(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-HOL/ASSM

Figure 3.-3 PLOT OF PRODUCTIVITY (HRS/LOC) VS. HOL/ASSM (MC=4.5, PC=200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(APPL.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .5400000E+01 Y= .3925040E+02
SCALE/INCH X= .5000000E+00 Y= .4711933E+01 -OR- TOLERANCE/POINT X= .2500000E-01 Y= .3925040E+00



(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-FACTOR (CONVERSION)

Figure 3.-4 PLOT OF PRODUCTIVITY (HRS/LOC) VS. FACTOR (MC=4.5, PC=200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SYST.-HI.ORDER LANG)

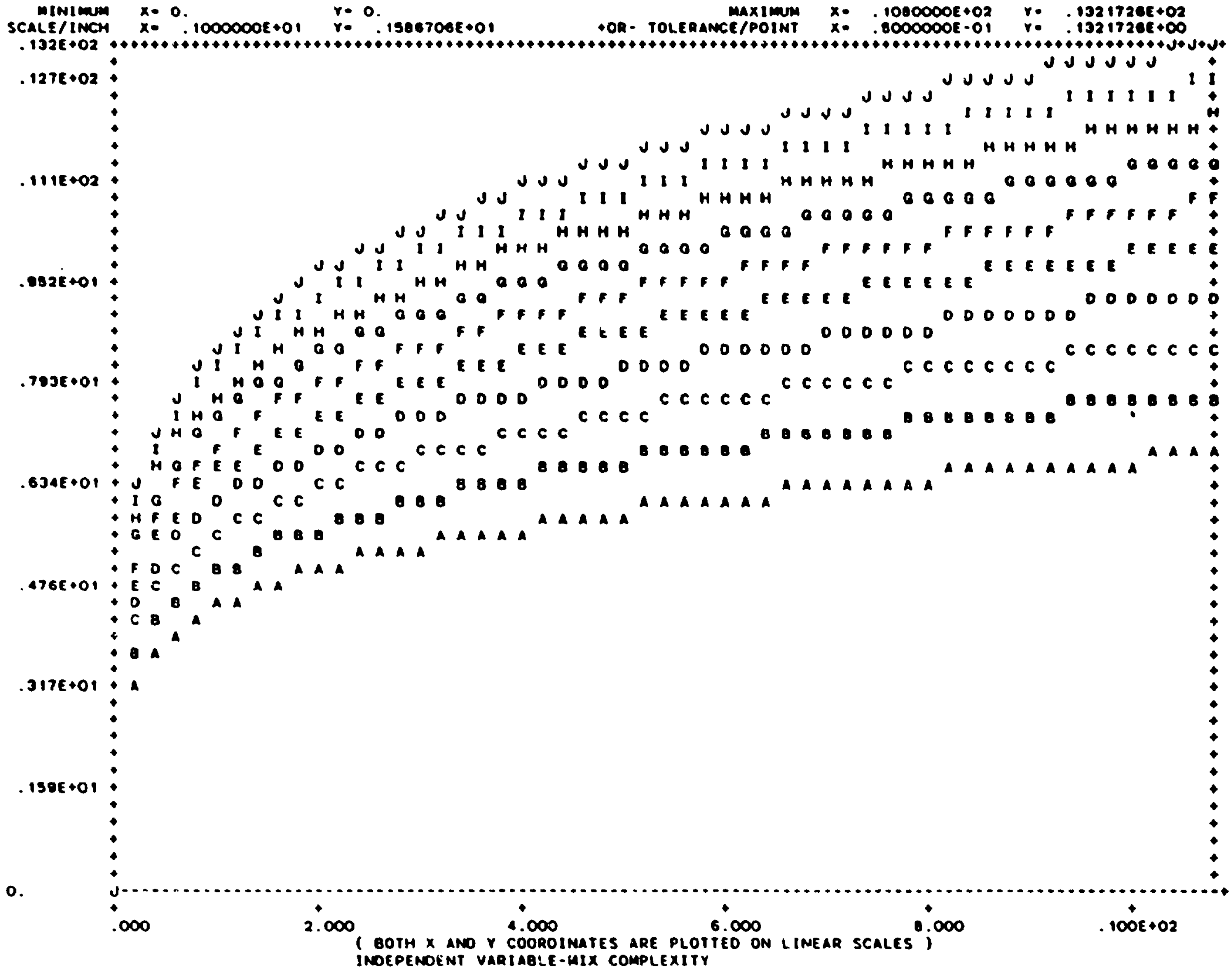
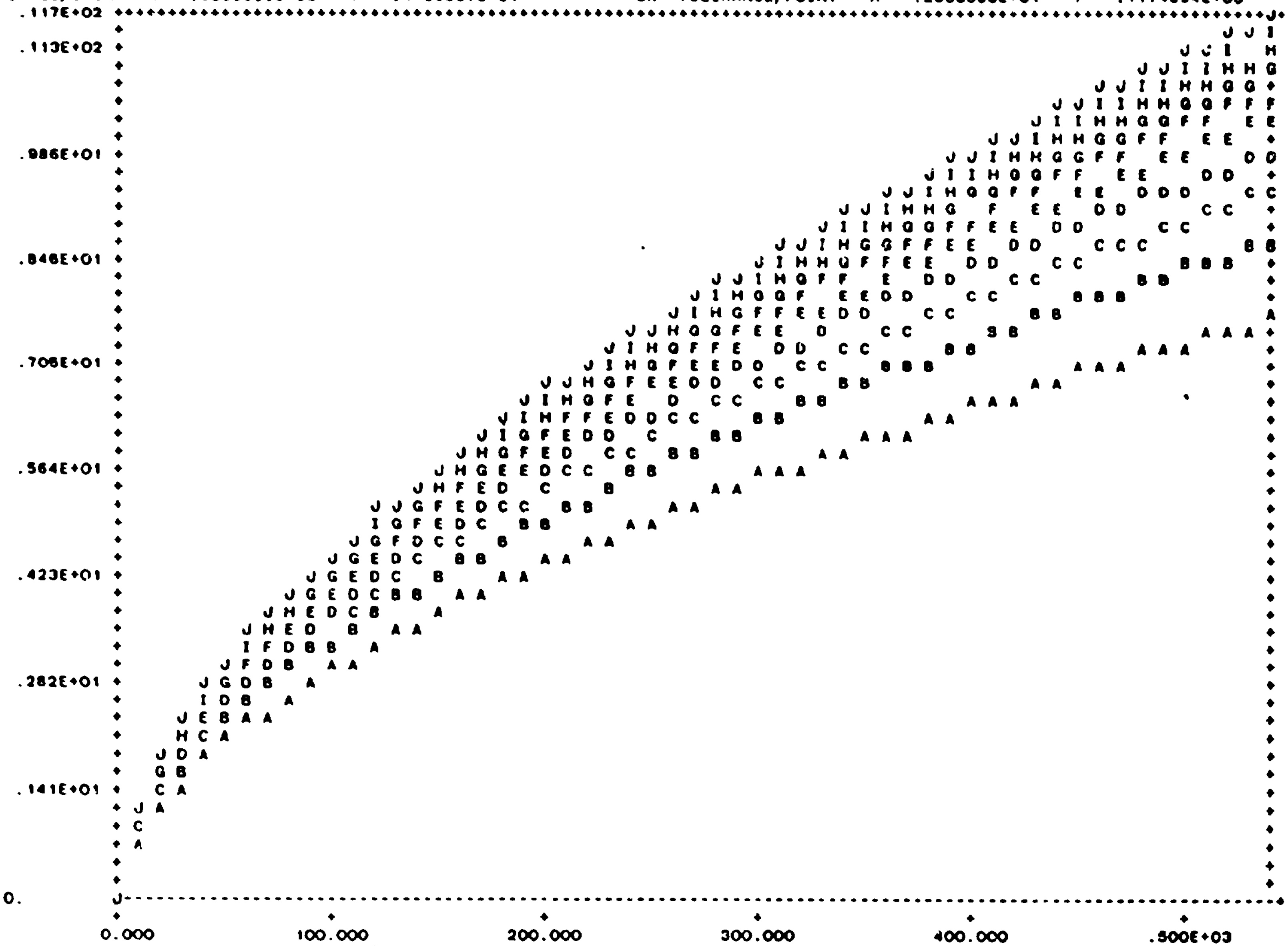


Figure 3.-5 PLOT OF PRODUCTIVITY (HRS/LOC) VS. MIX COMPLEXITY (PC-200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SYST.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .5400000E+03 Y= .1174394E+02
SCALE/INCH X= .5000000E+02 Y= .1409837E+01 +GR- TOLERANCE/POINT X= .2500000E+01 Y= .1174394E+00

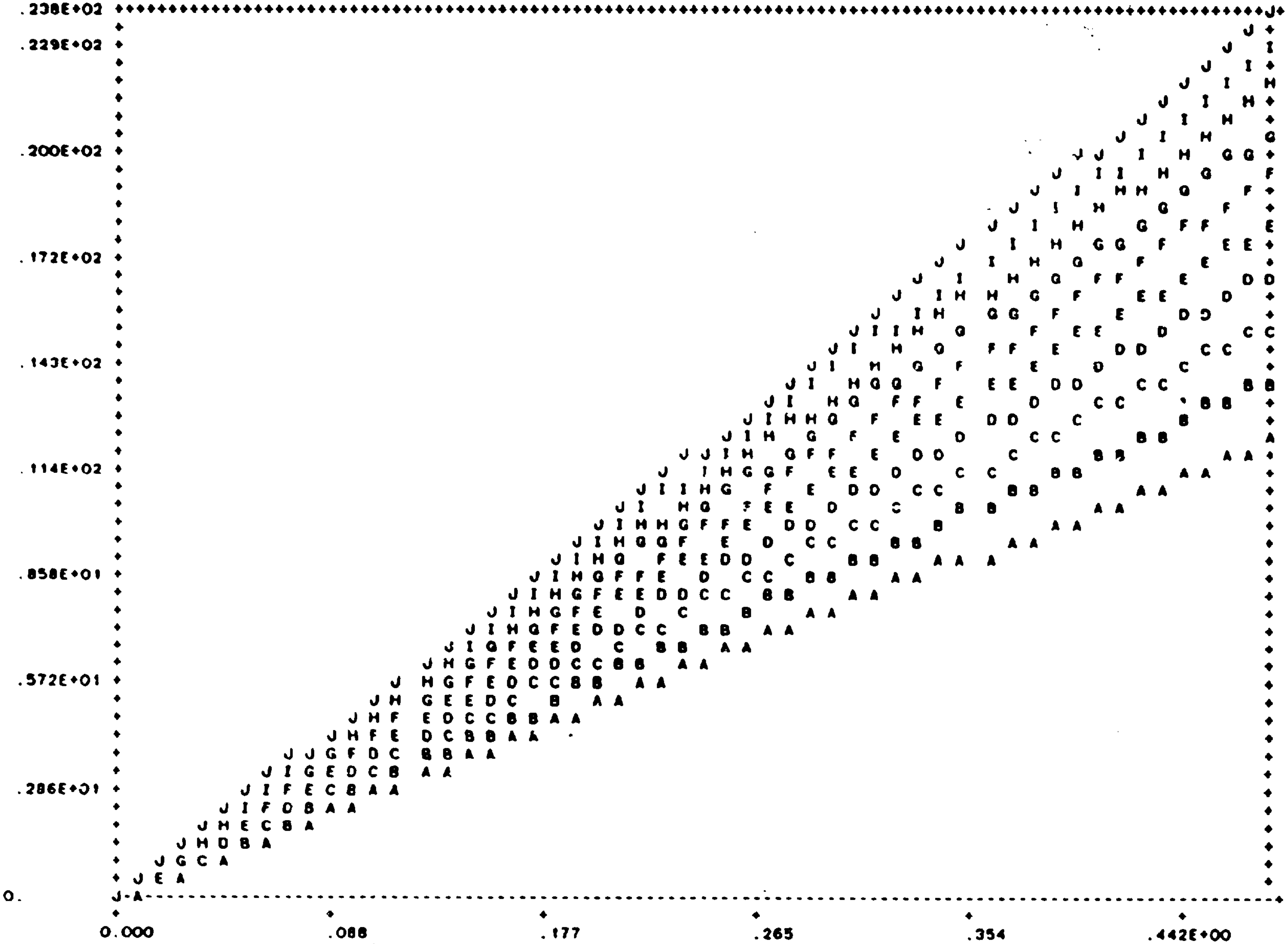


(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-PROGRAM COMPLEXITY

Figure 3.-6 PLOT OF PRODUCTIVITY (HRS/LOC) VS. PROGRAM COMPLEXITY (MC=1 TO 10)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SYST.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .4777133E+00 Y= .2383647E+02
SCALE/INCH X= .4423271E-01 Y= .286:521E+01 +OR- TOLERANCE/POINT X= .2211636E-02 Y= .2383647E+00



(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-HOL/ASSM (FACTOR=1)

Figure 3.-7 PLOT OF PRODUCTIVITY (HRS/LOC) VS. HOL/ASSM (MC=4.5, PC=200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SYST.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .5400000E+01 Y= .6071554E+02
SCALE/INCH X= .5000000E+00 Y= .7288781E+01 +OR- TOLERANCE/POINT X= .2500000E-01 Y= .6071554E+00

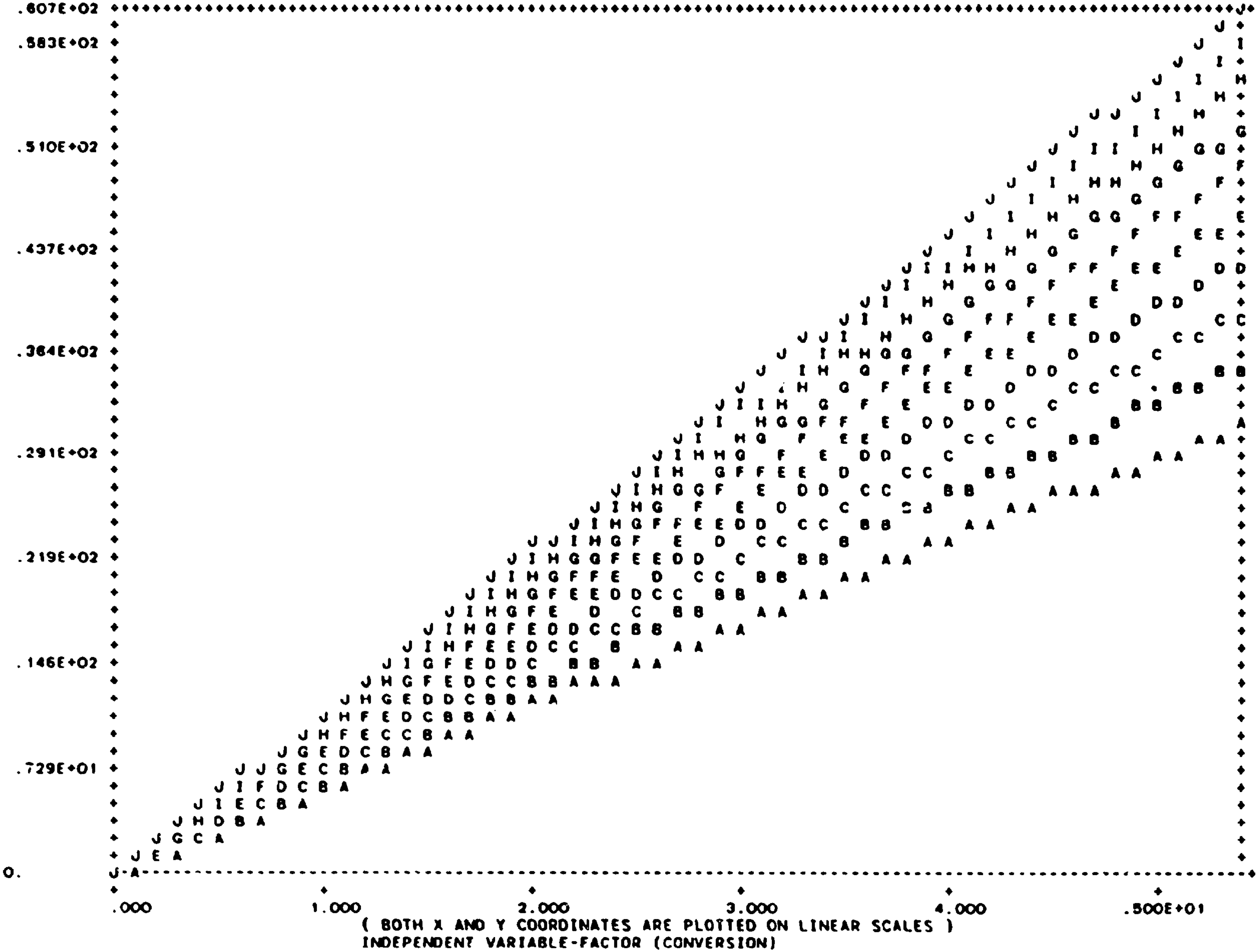
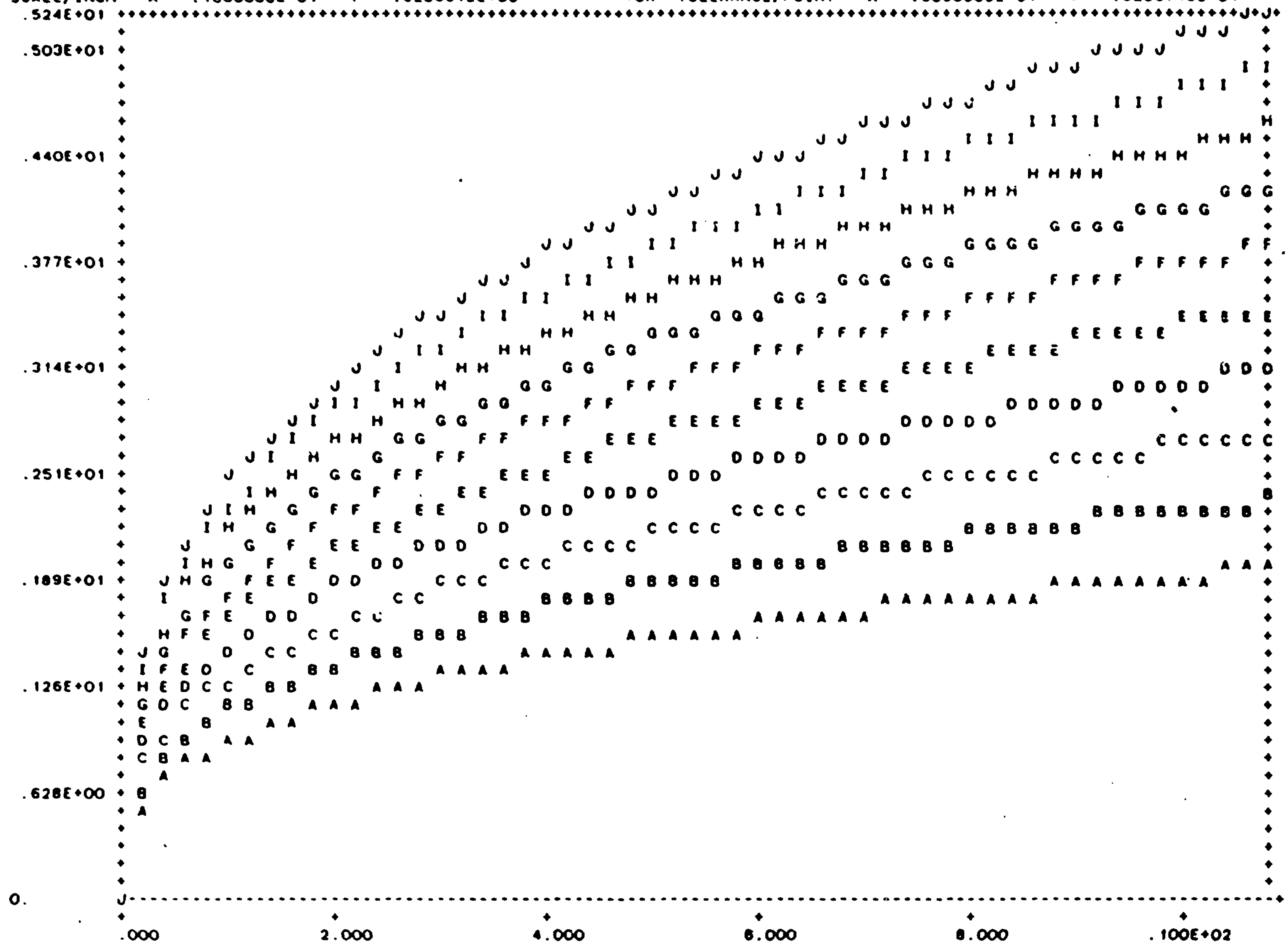


Figure 3.-8 PLOT OF PRODUCTIVITY (HRS/LOC) VS. FACTOR (MC=4.5, PC=200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SUPT.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .1080000E+02 Y= .5236748E+01
SCALE/INCH X= .1000000E+01 Y= .6286612E+00 +OR- TOLERANCE/POINT X= .5000000E-01 Y= .5236748E-01

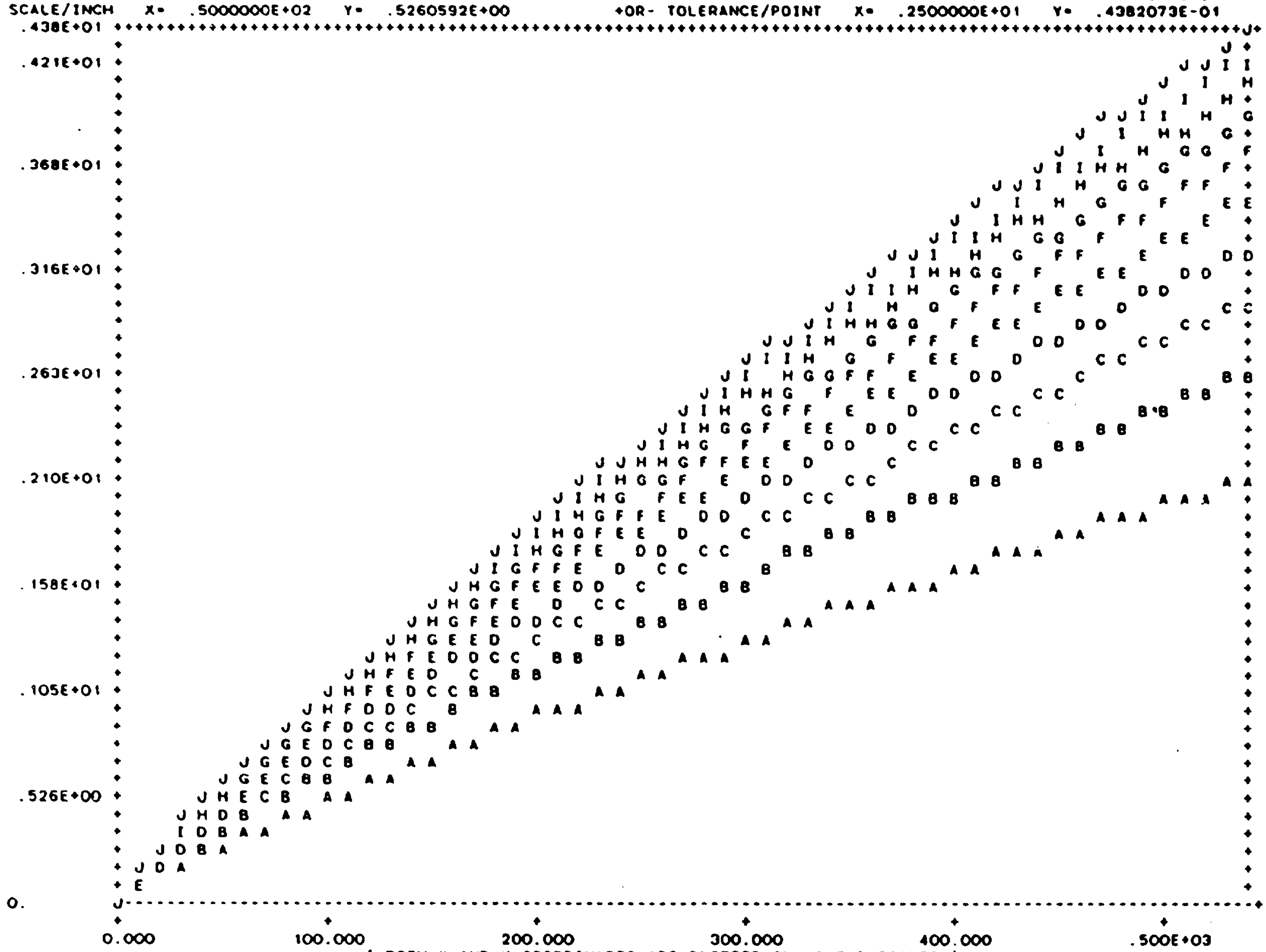


(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-MIX COMPLEXITY

Figure 3.-9 PLOT OF PRODUCTIVITY (HRS/LOC) VS. MIX COMPLEXITY (PC=200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SUPT.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .5400000E+03 Y= .4382073E+01
SCALE/INCH X= .5000000E+02 Y= .5260592E+00 +OR- TOLERANCE/POINT X= .2500000E+01 Y= .4382073E-01



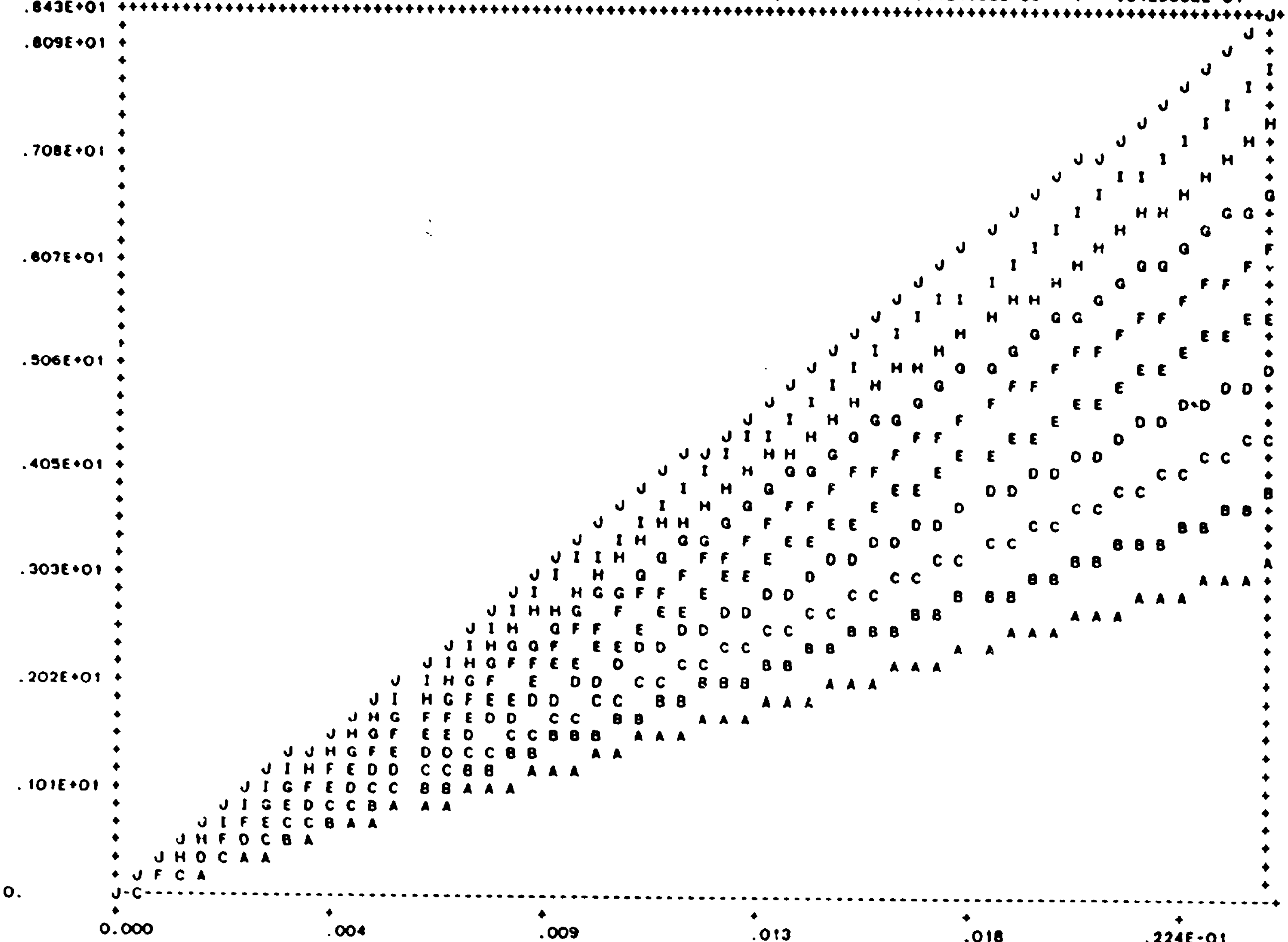
(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-PROGRAM COMPLEXITY

Figure 3.-10 PLOT OF PRODUCTIVITY (HRS/LOC) VS. PROGRAM COMPLEXITY (MC=1 TO 10)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SUPT.-HI.ORDER LANG)

MINIMUM X= 0. Y= 0. MAXIMUM X= .2422769E-01 Y= .8429332E+01

SCALE/INCH X= .2243304E-02 Y= .1011925E+01 +OR- TOLERANCE/POINT X= .1121652E-03 Y= .8429332E-01

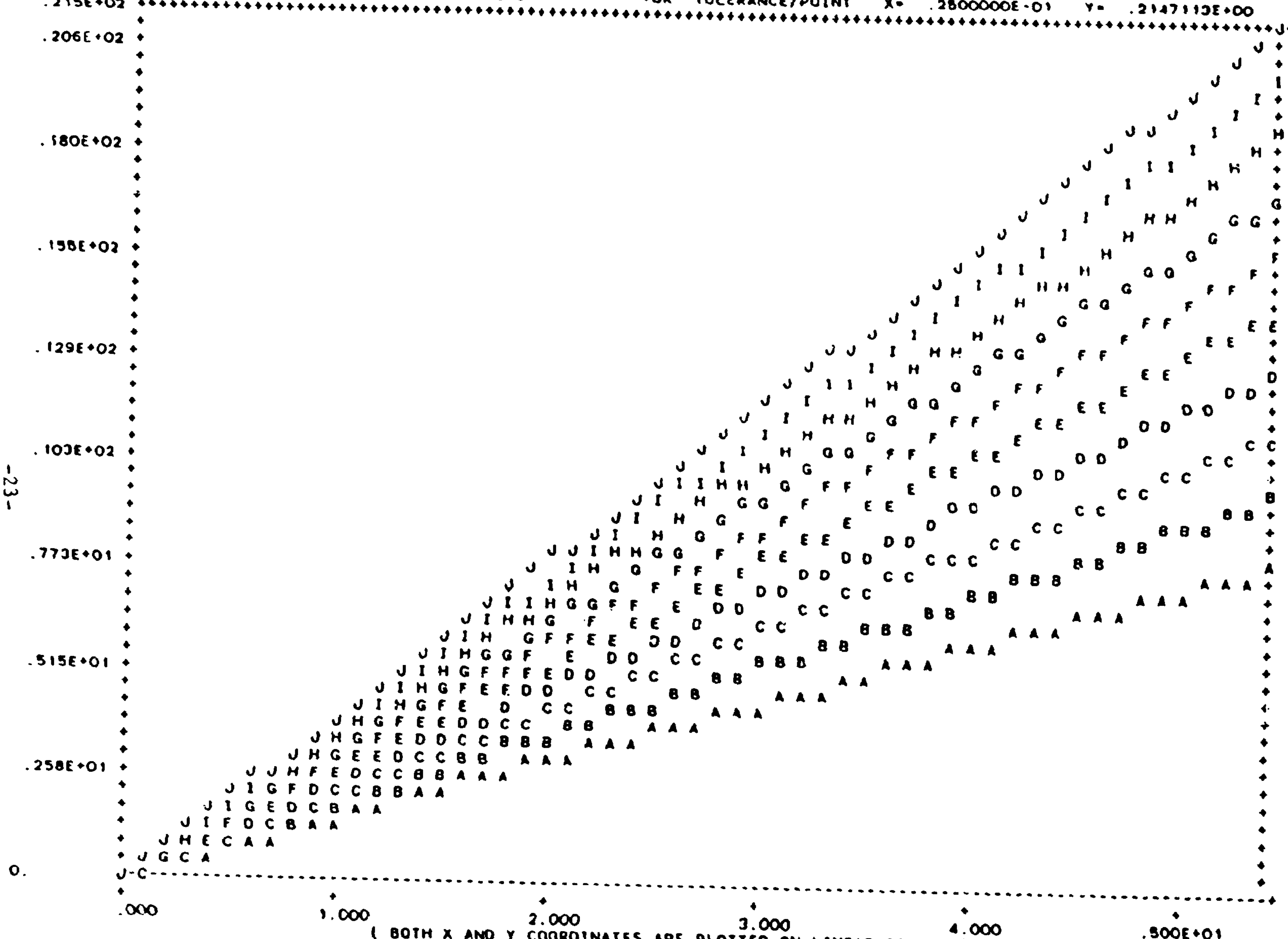


(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-HOL/ASSM (FACTOR=1)

Figure 3.-11 PLOT OF PRODUCTIVITY (HRS/LOC) VS. HOL/ASSM (MC=4.5, PC=200-650)

PARAMETRIC COST ESTIMATES-DR. AARON N. SILVER-AVIONICS SW.(SUPT.-HI.ORDER LANG)

MINIMUM	X= 0.	Y= 0.	MAXIMUM	X= .5400000E+01	Y= .2147113E+02
SCALE/INCH	X= .5000000E+00	Y= .2577567E+01	+OR- TOLERANCE/POINT	X= .2800000E-01	Y= .2147113E+00



(BOTH X AND Y COORDINATES ARE PLOTTED ON LINEAR SCALES)
INDEPENDENT VARIABLE-FACTOR (CONVERSION)

Figure 3.-12

PLOT OF PRODUCTIVITY (HHS/LOC) VS. FACTOR (MC=4.5, PC=200-850)

IV. CONTRACT EXPENDITURES

The total amount of funds (dollars) expended for the performance period 2 January 1986 through 4 April 1987 are approximately $235,300 (including fee).

The revised schedule for the CDRL item deliverables A006, A007, A008, and A009 are shown in Appendix II. The Modification Request for this effort is documented in Appendix III.

Respectfully submitted,

Dr. Aaron N. Silver

Dr. Aaron N. Silver
Program Manager

MARTIN MARIETTA CORPORATION

STUDY TASKS AND OBJECTIVES

TASK III: DEVELOP COST ESTIMATING RELATIONSHIPS (CERs) BETWEEN FUNCTIONS/PRODUCTS, SOFTWARE COSTS, AND ACQUISITION PHASES.

OBJECTIVES:

TO FORMULATE A FULLY INTEGRATED METHODOLOGY AND DEVELOP APPROPRIATE ANALYSIS TECHNIQUES FOR THE GENERATION OF COST ESTIMATING RELATIONSHIPS (CERS).

TO PROVIDE CRITERIA, PERFORMANCE MEASURES, AND PROCEDURES FOR ALL SOFTWARE COST ESTIMATING MODELS.

TO FURNISH PRELIMINARY CER PROTOTYPES FOR CONDUCTING FUNCTIONAL SIZING, COSTING, AND SCHEDULING.

TASK IV: DEVELOP METHODS AND PROCEDURES THAT WILL RELATE FUNCTION/PRODUCT ACQUISITION SOFTWARE COST ESTIMATES TO TOTAL LIFE CYCLE COST.

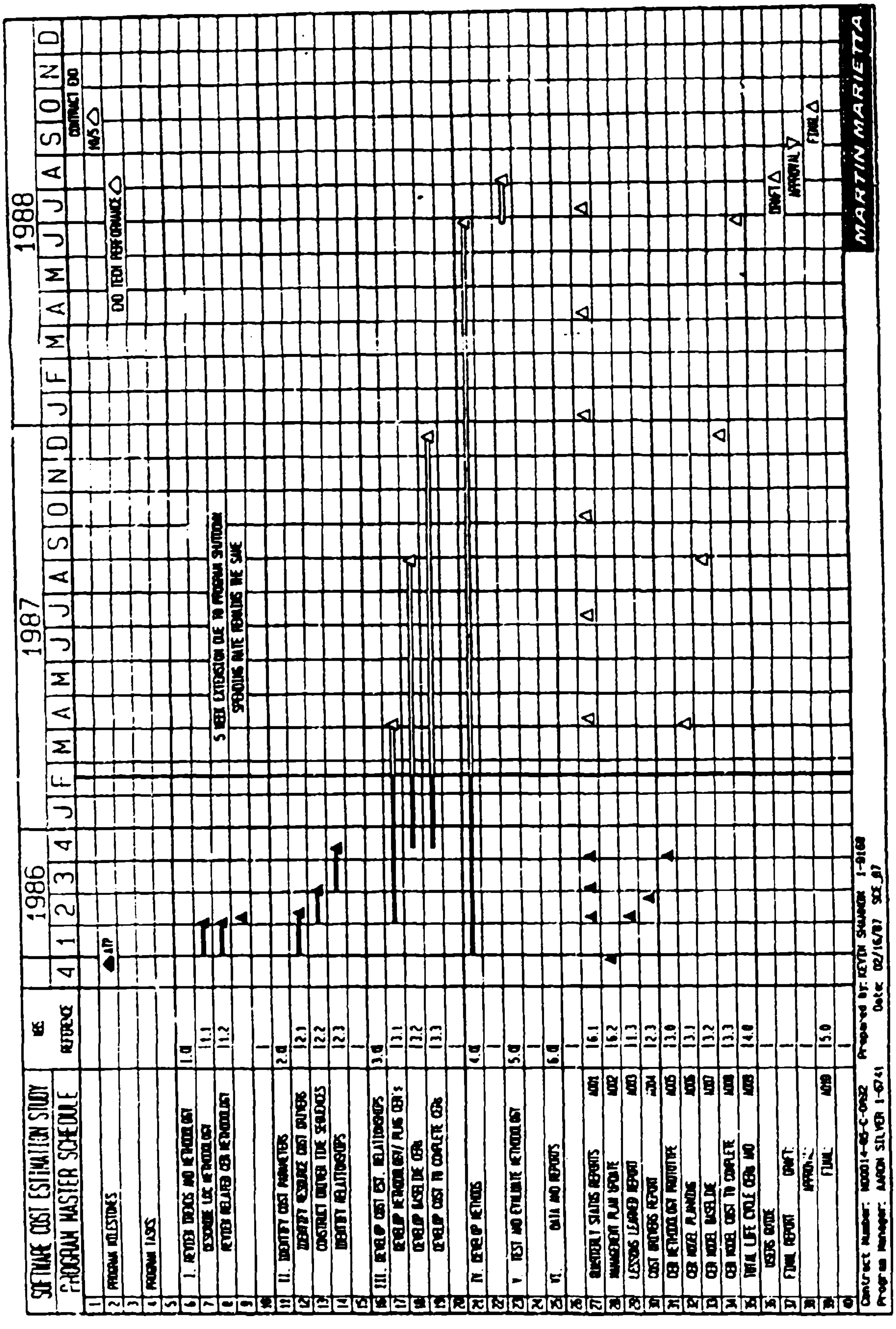
OBJECTIVES:

TO PROVIDE VISIBILITY WITH RESPECT TO SOFTWARE COST ELEMENTS ON A FUNCTION/PRODUCT BASIS.

TO EXPEDITIOUSLY INTEGRATE SOFTWARE COST ESTIMATES INTO THE TOTAL LIFE CYCLE DEVELOPMENT PROCESS.

MARTIN MARIETTA

APPENDIX II.


SOFTWARE COST ESTIMATION STUDY
PROGRAM MASTER SCHEDULE
WBS REFERENCE
1986
1987
1988
4 1 2 3 4
J F M A M J J A S O N D
J F M A M J J A S O N D
PROGRAM MILESTONES
ATP
CONTRACT END
10/5
END TECH PERFORMANCE
PROGRAM TASKS
I. REVIEW TRENDS AND METHODOLOGY 1.0
DESCRIBE LOC METHODOLOGY 1.1
REVIEW RELATED CER METHODOLOGY 1.2
5 WEEK EXTENSION DUE TO PROGRAM SHUTDOWN
SPENDING RATE REMAINS THE SAME
II. IDENTIFY COST PARAMETERS 2.0
IDENTIFY RESOURCE COST DRIVERS 2.1
CONSTRUCT DRIVER TIME SEQUENCES 2.2
IDENTIFY RELATIONSHIPS 2.3
III. DEVELOP COST EST. RELATIONSHIPS 3.0
DEVELOP METHODOLOGY/ PLUG CER's 3.1
DEVELOP BASELINE CERs 3.2
DEVELOP COST TO COMPLETE CERs 3.3
IV. DEVELOP METHODS 4.0
V. TEST AND EVALUATE METHODOLOGY 5.0
VI. DATA AND REPORTS 6.0
QUARTERLY STATUS REPORTS A001 6.1
MANAGEMENT PLAN UPDATE A002 6.2
LESSONS LEARNED REPORT A003 1.3
COST DRIVERS REPORT A004 2.3
CER METHODOLOGY PROTOTYPE A005 3.0
CER MODEL PLANNING A006 3.1
CER MODEL BASELINE A007 3.2
CER MODEL COST TO COMPLETE A008 3.3
TOTAL LIFE CYCLE CERs AND A009 4.0
USERS GUIDE
FINAL REPORT DRAFT
APPROVAL
FINAL A010 5.0
DRAFT
APPROVAL
FINAL
Contract Number: N00014-85-C-0932
Program Manager: AARON SILVER 1-6741
Prepared by: KEVIN SHANNON 1-9168
Date: 02/16/87 SCE_87
MARTIN MARIETTA

APPENDIX III.

MARTIN MARIETTA DENVER AEROSPACE

POST OFFICE BOX 179
DENVER, COLORADO 80201
TELEPHONE (303) 977-3000

16 February 1987

Refer to: TEO-87-0085

To: Air Force Plant Representatives Office
Martin Marietta Denver Aerospace
P.O. Box 179, Mail Stop A-18
Denver, CO 80201-0179

Attn: Capt. Joe M. Williams (RNA)

Subj: Contract N00014-85-C-0892; Request for Modification

Ref: (a) Martin Marietta Letter TEO-86-0729 dated 24 November 1986; Subject: Notice of stop in work due to non-receipt of FY'87 funds

(b) Modification No. P00003 dated 8 January 1987 and received 14 January 1987

Encl: (1) Revised Program Master Schedule

1. Martin Marietta requests a no-cost, five (5) week extension to the current period of performance for the technical effort, from 9 December 1985 through 30 June 1988, to 9 December 1985 through 5 August 1988.

2. This request is a result of a stop in work during the period between 23 November 1986 and 12 January 1987 due to exhaustion of contract funds as documented by References (a) and (b).

3. In addition, in an effort to respread contract effort more evenly, it is requested that the submittal dates for several items contained in the Contract Data Requirements List be changed as follows:

Sequence Number	Block 12 Currently	Block 12 Proposed Revision
A006	14 months after contract award	16 months after contract award
A007	15 months after contract award	20 months after contract award
A008	16 months after contract award	24 months after contract award
A009	20 months after contract award	32 months after contract award

The above proposed revision dates were co-ordinated with Mr. Brian Flynn (ONR) by Dr. Aaron Silver (Martin Marietta) during Mr. Flynn's last visit at the Denver facility.

4. Enclosure (1) details the revised Program Master Schedule incorporating all of the above changes.

5. Questions concerning this transmittal should be directed to Cyndi McKay at (303) 971-9180.

Very truly yours,

MARTIN MARIETTA CORPORATION

David L. Lucero
Manager, Program Contracts
Technical Operations
Denver Aerospace

DLL/CLM/do

cc: ONR, D. Perdue, 1513A:DHP